

## CLAIMS

1. A broad-band plate antenna in which a single linear element portion and a slot element portion are integrally formed; wherein

5 a one-end-open non-conductive surface (25) is provided in a conductive substrate (10) in parallel to a part of an outer perimeter of the conductive substrate, so as to form a linear element portion (22) between the part of the outer perimeter and the one-end-open non-conductive surface,

10 a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said one-end-open non-conductive surface, so as to form a slot element portion (24),

15 a non-conductive portion (28) is provided in a feeding point forming conductive portion (23) formed between the one-end-open non-conductive surface and the slot element portion, so as to use opposing ends of said non-conductive portion as a feeding point (14), and

remaining conductive portion of the conductive substrate other than said linear element portion, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion (21).

20 2. A broad-band plate antenna in which a single linear element portion and a slot element portion are integrally formed; wherein

25 a one-end-open gap portion (25) is provided in a conductive substrate (10) in parallel to a part of an outer perimeter of the conductive substrate, so as to form a linear element portion (22) between the part of the outer perimeter and the one-end-open gap portion,

a slot is provided in the conductive substrate in parallel to said one-end-open gap portion, so as to form a slot element portion (24),

an opening portion (28) is provided in a feeding point forming conductor portion

(23) formed between the one-end-open gap portion and the slot element portion, so as to use opposing ends of the opening portion as a feeding point (14), and

remaining conductive substrate other than said linear element portion, said slot element portion, and said feeding point forming conductor portion is used as a groundplate portion (21).

3. A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open non-conductive surface (25a) is provided in a conductive substrate (10) in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (22a) between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface (25b) is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion (22b) between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a slot element portion (24),

a non-conductive portion (28) is provided in a feeding point forming conductive portion (23) formed between the second linear element portion and the slot element portion, so as to use opposing ends of said non-conductive portion as a feeding point (14), and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion (21).

4. A broad-band plate antenna in which a plurality of linear element portions and

a slot element portion are integrally formed; wherein

a first one-end-open gap portion (25a) is provided in a conductive substrate (10) in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (22a) between the part of the outer perimeter and the first one-end-open gap portion,

a second one-end-open gap portion (25b) is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion (22b) between said second one-end-open gap portion and the first one-end-open gap portion,

a slot is provided in the conductive substrate in parallel to said second one-end-open gap portion, so as to form a slot element portion (24),

an opening portion (28) is provided in a feeding point forming conductor portion (23) formed between the second linear element portion and the slot element portion, so as to use opposing ends of said opening portion as a feeding point (14), and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductor portion is used as a groundplate portion (21).

5. A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open non-conductive surface (25a) is provided in a conductive substrate (10) in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (22a) between the part of the outer perimeter and the first one-end-open non-conductive surface,

a plurality of one-end-open non-conductive surfaces consisting of a second one-end-open non-conductive surface (25b) to an Nth one-end-open non-conductive surface (25n) are provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a plurality of linear element portions consisting of a

second linear element portion (22b) to an Nth linear element portion (22n) between said one-end-open non-conductive surfaces,

a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said Nth one-end-open non-conductive surface, so as to form a slot element portion (24),

a non-conductive portion (28) is provided in a feeding point forming conductive portion (23) formed between the Nth one-end-open non-conductive surface and the slot element portion, so as to use opposing ends of said non-conductive portion as a feeding point (14), and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion (21).

6. A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open non-conductive surface (25a) is provided in a conductive substrate (10) in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) of which length on an outer peripheral side of the conductive substrate is shorter, between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface (25b) is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion (30b) having a length longer than the first linear element portion between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a slot element portion (24),

a non-conductive portion (28) is provided in a feeding point forming conductive portion (23) formed between the second linear element portion and the slot element portion, so as to use opposing ends of said non-conductive portion as a feeding point (14),

5        the first linear element portion and a feeding point forming conductor portion are connected to each other by a first conductor portion (31), and

         remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion (21).

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7. A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

         a first one-end-open gap portion (25a) is provided in a conductive substrate (10) in parallel to a part of an outer perimeter of the conductive substrate, so as to form a  
15       first linear element portion (30a) between the part of the outer perimeter and the first one-end-open gap portion,

         a second one-end-open gap portion (25b) is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion (30b) having a length longer than the first linear element portion between said  
20       second one-end-open gap portion and the first one-end-open gap portion,

         a slot is provided in the conductive substrate in parallel to said second one-end-open gap portion, so as to form a slot element portion (24),

         an opening portion (28) is provided in a feeding point forming conductor portion (23) formed between the second linear element portion and the slot element portion, so  
25       as to use opposing ends of said opening portion as a feeding point (14),

         the first linear element portion and the feeding point forming conductor portion are connected to each other by a first conductor portion (31), and

         remaining conductive substrate other than said plurality of linear element

portions, said slot element portion, and said feeding point forming conductor portion is used as a groundplate portion (21).

8. A broad-band plate antenna in which a plurality of linear element portions and a slot element portion are integrally formed; wherein

a first one-end-open non-conductive surface (25a) is provided in a conductive substrate (10) in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) between the part of the outer perimeter and the first one-end-open non-conductive surface,

a plurality of one-end-open non-conductive surfaces consisting of a second one-end-open non-conductive surface (25b) to an Nth one-end-open non-conductive surface (25n) are provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a plurality of linear element portions consisting of a second linear element portion (30b) to an Nth linear element portion (30n), having a length longer than the first linear element portion, between said one-end-open non-conductive surfaces,

a closed rectangle shaped non-conductive surface is provided in the conductive substrate in parallel to said Nth one-end-open non-conductive surface, so as to form a slot element portion (24),

a non-conductive portion (28) is provided in a feeding point forming conductive portion (23) formed between the Nth one-end-open non-conductive surface and the slot element portion, so as to use opposing ends of said non-conductive portion as a feeding point (14),

the first linear element portion and a feeding point forming conductor portion are connected to each other by a first conductor portion (31), and

remaining conductive substrate other than said plurality of linear element portions, said slot element portion, and said feeding point forming conductive portion is used as a groundplate portion (21).

9. A broad-band plate antenna including a conductive substrate (10) forming a composite element portion and a groundplate portion (21); wherein

5 a first one-end-open non-conductive surface (25a) is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) between the part of the outer perimeter and the first one-end-open non-conductive surface,

10 a second one-end-open non-conductive surface (25b) is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion (30b) having a length longer than the first linear element portion between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

15 a third one-end-open non-conductive surface (25c) is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a third linear element portion (30c) having a length shorter than the second linear element portion between said third one-end-open non-conductive surface and the second one-end-open non-conductive surface, and an area of a non-conductive portion between the second linear element portion and the groundplate portion is made larger,

20 a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion (26),

one feeding point (14a) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

25 the other feeding point (14b) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion (31).

10. A broad-band plate antenna including a conductive substrate (10) forming a composite element portion and a groundplate portion (21); wherein

5 a first one-end-open gap portion (25a) is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) between the part of the outer perimeter and the first one-end-open gap portion,

10 a second one-end-open gap portion (25b) is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion (30b) having a length longer than the first linear element portion between said second one-end-open gap portion and the first one-end-open gap portion,

15 a third one-end-open gap portion (25c) is provided in the conductive substrate in parallel to said second one-end-open gap portion, so as to form a third linear element portion (30c) having a length shorter than the second linear element portion between said third one-end-open gap portion and the second one-end-open gap portion, and an area of a gap portion between the second linear element portion and the groundplate portion is made larger,

20 a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion (26),

one feeding point (14a) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

25 the other feeding point (14b) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion (31).



11. A broad-band plate antenna including a conductive substrate (10) forming a composite element portion and a groundplate portion (21); wherein

a first one-end-open non-conductive surface (25a) is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface (25b) is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion (30b) having a length longer than the first linear element portion and an area made larger in a direction of the first linear element portion between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

a third one-end-open non-conductive surface (25c) is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a third linear element portion (30c) having a length shorter than the second linear element portion between said third one-end-open non-conductive surface and the second one-end-open non-conductive surface, and an area of a non-conductive portion between the second linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion (26),

one feeding point (14a) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

the other feeding point (14b) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion (31).

12. A broad-band plate antenna including a conductive substrate (10) forming a composite element portion and a groundplate portion (21); wherein

5 a first one-end-open gap portion (25a) is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) between the part of the outer perimeter and the first one-end-open gap portion,

10 a second one-end-open gap portion (25b) is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion (30b) having a length longer than the first linear element portion and an area made larger in a direction of the first linear element portion between said second one-end-open gap portion and the first one-end-open gap portion,

15 a third one-end-open gap portion is provided in the conductive substrate in parallel to said second one-end-open gap portion, so as to form a third linear element portion (30c) having a length shorter than the second linear element portion between said third one-end-open gap portion and the second one-end-open gap portion, and an area of a gap portion between the second linear element portion and the groundplate portion is made larger,

20 a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion (26),

one feeding point (14a) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

25 the other feeding point (14b) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion (31).

13. A broad-band plate antenna including a conductive substrate (10) forming a composite element portion and a groundplate portion (21); wherein

5 a first one-end-open non-conductive surface (25a) is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) between the part of the outer perimeter and the first one-end-open non-conductive surface,

10 a second one-end-open non-conductive surface (25b) is provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion (30b) having a length longer than the first linear element portion and an area made larger in a direction of the first linear element portion and in a direction opposite to the first linear element portion between said second one-end-open non-conductive surface and the first one-end-open non-conductive surface,

15 a third one-end-open non-conductive surface (25c) is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a third linear element portion (30c) having a length shorter than the second linear element portion between said third one-end-open non-conductive surface and the second one-end-open non-conductive surface, an area of a non-conductive portion between the second linear element portion and the groundplate portion is made larger, and a  
20 conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion (26),

one feeding point (14a) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

25 the other feeding point (14b) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected

to each other by a first conductor portion (31).

14. A broad-band plate antenna including a conductive substrate (10) forming a composite element portion and a groundplate portion (21); wherein

5 a first one-end-open gap portion (25a) is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) between the part of the outer perimeter and the first one-end-open gap portion,

10 a second one-end-open gap portion (25b) is provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion (20b) having a length longer than the first linear element portion and an area made larger in a direction of the first linear element portion and in a direction opposite to the first linear element portion between said second one-end-open gap portion and the first one-end-open gap portion,

15 a third one-end-open gap portion (25c) is provided in the conductive substrate in parallel to said second one-end-open non-conductive surface, so as to form a third linear element portion (30c) having a length shorter than the second linear element portion between said third one-end-open gap portion and the second one-end-open gap portion, and an area of a gap portion between the second linear element portion and the  
20 groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion (26),

25 one feeding point (14a) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the second linear element portion,

the other feeding point (14b) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the third linear element portion, and

the first linear element portion and the third linear element portion are connected to each other by a first conductor portion (31).

15. A broad-band plate antenna including a conductive substrate (10) forming a composite element portion and a groundplate portion (21); wherein

a first one-end-open non-conductive surface (25a) is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) between the part of the outer perimeter and the first one-end-open non-conductive surface,

a second one-end-open non-conductive surface (25b) to an Nth one-end-open non-conductive surface (25n) are provided in the conductive substrate in parallel to said first one-end-open non-conductive surface, so as to form a second linear element portion to an Nth linear element portion (30n) between said second one-end-open non-conductive surface and the Nth one-end-open non-conductive surface, an (N-1)th linear element portion (30n-1) second closest to the groundplate portion has a length longer than an (N-2)th linear element portion (30n-2) third closest to the groundplate portion and an Nth linear element portion (30n) closest to the groundplate portion, an area of the (N-1)th linear element portion is made larger in a direction of the (N-2)th linear element portion or in a direction of the Nth linear element portion or in the direction of the (N-2)th linear element portion and the direction of the Nth linear element portion, and an area of a non-conductive portion between the (N-1)th linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion (26),

one feeding point (14a) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the (N-1)th linear element portion,

the other feeding point (14b) is provided in vicinity of said each-element-

groundplate commonly short-circuiting conductive portion of the Nth linear element portion, and

an area in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the (N-2)th linear element portion and an area in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the Nth linear element portion are connected to each other by a first conductor portion (31).

16. A broad-band plate antenna including a conductive substrate (10) forming a composite element portion and a groundplate portion (21); wherein

a first one-end-open gap portion (25a) is provided in the conductive substrate in parallel to a part of an outer perimeter of the conductive substrate, so as to form a first linear element portion (30a) between the part of the outer perimeter and the first one-end-open gap portion,

a second one-end-open gap portion (25b) to an Nth one-end-open gap portion (25n) are provided in the conductive substrate in parallel to said first one-end-open gap portion, so as to form a second linear element portion (30b) to an Nth linear element portion (30n) between said second one-end-open gap portion and the Nth one-end-open gap portion, an (N-1)th linear element portion (30n-1) second closest to the groundplate portion has a length longer than an (N-2)th linear element portion (30n-2) third closest to the groundplate portion and an Nth linear element portion closest to the groundplate portion, an area of the (N-1)th linear element portion is made larger in a direction of the (N-2)th linear element portion or in a direction of the Nth linear element portion or in the direction of the (N-2)th linear element portion and the direction of the Nth linear element portion, and an area of a gap portion between the (N-1)th linear element portion and the groundplate portion is made larger,

a conductive portion commonly short-circuiting each element to the groundplate portion is identified as each-element-groundplate commonly short-circuiting conductive portion (26),

one feeding point (14a) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the (N-1)th linear element portion, the other feeding point (14b) is provided in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the Nth linear element portion, and

an area in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the (N-2)th linear element portion and an area in vicinity of said each-element-groundplate commonly short-circuiting conductive portion of the Nth linear element portion are connected to each other by a first conductor portion (31).

17. A broad-band plate antenna, wherein the feeding point according to claims 1 to 16 is connected to an internal conductor (5a) and an external conductor (5b) of a coaxial cable (5).

18. A broad-band plate antenna, wherein the feeding point according to claims 1 to 16 is connected to an internal conductor and an external conductor of a coaxial cable to which a sperrtopf (9) is applied.

19. A broad-band plate antenna having a sperrtopf (19) adapted to two operation frequencies, wherein

a first cylindrical conductor (19a) having a length corresponding to 1/4 wavelength of a first operation frequency out of two operation frequencies is disposed on an outer circumference of an external conductor of the coaxial cable (5) according to claim 17, a second cylindrical conductor (19b) having a length corresponding to 1/4 wavelength of a second operation frequency out of two operation frequencies is disposed outside said first cylindrical conductor, and said sperrtopf (19) short-circuits said first cylindrical conductor and said second cylindrical conductor to the external conductor of the coaxial cable.